

CENTER FOR

ACOUSTIC COOLING

CENTER

The Center for Acoustic Cooling Technologies has been established for the application of thermo acoustic devices to heat management and heat removal from microcircuits, computers, high speed electronics, and small scale applications.

Industrial collaboration with a
local company
Venture Capital Investments from
SUTI

ACCOMPLISHMENTS

This is the first year for the Center for Acoustic Cooling. It is structured on fundamental developments of miniature thermo-acoustic devices supported by the Office of Naval Research, the interfacing of devices to microcircuits and computers as supported by DARPA (HERETIC Program), and industrial collaboration with a local company, for the development and commercialization of Center technologies. This effort has attracted the interest of a venture capital investment company, SUTI, in California.

UNIVERSITY OF UTAH

Can you imagine.....

A miniature cooling device that replaces fans in airplane cockpit displays and personal computers using sound as the main energy source and measures from 4 cm to less than 1 cm?



TECHNOLOGY

The center's technology is based on two effects in thermo acoustics. The first is that heat can be converted into sound energy; and second, sound can pump heat. Both have been developed into devices with dimensions ranging from 4 cm to 0.8 cm with the possibility for further miniaturization and micro-circuit integration.

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CENTER FOR

ADVANCED JOINING OF MATERIALS

CENTER

The Center for Advanced Joining of Materials (**CAJM**) is developing enhancements and new technologies in friction stir welding (FSW). FSW is a relatively new innovative joining technology that is revolutionizing the way in which aluminum and copper materials are being joined. The objectives are to develop enhancements to this existing technology that will broaden the use of this process in new materials and applications.

TECHNOLOGY

The Center is currently focused on the development and marketing of three technological aspects of FSW: 1) tooling that will last longer, offer the ability to join a wider range of advanced materials, and enable better control of the resulting quality of weld and properties, 2) new control systems and hardware for large scale three-dimensional FSW capabilities; and 3) new methods and novel tooling for joining polymeric materials.

ACCOMPLISHMENTS

All of the first-year milestones have been met. To date, the Center has submitted three provisional patents. Of these, BYU has issued an exclusive license for the patent on super abrasive tools to a local Utah company. Co-development and marketing of these tools are continuing. BYU is presently seeking a partner for co-development on the FSW of polymeric materials. With respect to the direct machining and controls patent, BYU held a meeting in May at which a direct machining prototype was demonstrated. Those in attendance included Ford Motor Company, The Boeing Company, Intel, and Aires (Japan).. Of those in attendance, there was a strong agreement that these companies wanted this technology to be moved to commercialization as soon as possible.

BRIGHAM YOUNG UNIVERSITY

Can you imagine.....

A new method for welding metals and plastics that does not melt the material, does not add new material, and forms a joint that is base metal strong and virtually undetectable from the surrounding material?



As a result, BYU is presently establishing a consortium of end-users to fund the final phases of development. Likewise, BYU is seeking a business partner through which this technology can be licensed and marketed.

**Exclusive Licensing agreement
signed with a Utah company
3 provisional patents submitted**

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CENTER FOR

ADVANCED STRUCTURAL COMPOSITES

CENTER

The objective of the Center for Advanced Structural Composites is to develop the commercial potential of the IsoTruss technology. The IsoTruss enables the creation of super lightweight grid structures with the potential of revolutionizing industries as diverse as civil infrastructure (e.g., communication and construction) aerospace, automotive, marine and sporting structures, virtually in any application area requiring high strength, high stiffness, light weight and superb corrosion resistance.

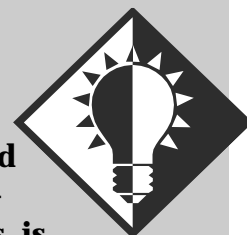
TECHNOLOGY

The core technology consists of an ultra-lightweight composite structural shape known as the IsoTruss. The IsoTruss is a novel, patented three-dimensional structural form that takes advantage of the highly directional properties of high strength composites to produce an extremely efficient and lightweight structure. The IsoTruss incorporates stable geometric configurations with helical members that spiral in opposing directions around a central cavity, coupled with longitudinal members that pass through the intersections.

BRIGHAM YOUNG UNIVERSITY

Can you imagine.....

A power line transmission tower that can withstand extreme wind conditions, support tremendously heavy loads, is corrosion free, is unaffected by temperature extremes, and weighs significantly less than conventional steel towers?



ACCOMPLISHMENTS

Several companies are currently negotiating licensing agreements with BYU. This technology, along with expanding applicability, should solve many commercial and engineering solutions to structural problems.

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CENTER FOR

BIOMEDICAL OPTICS

CENTER

The goal of the Center for Biomedical Optics is to commercialize optical technologies for diagnostic, therapeutic and disease risk assessment in medicine. Recent advances in novel light sources, laser materials and laser spectroscopy make these optical techniques highly attractive for novel, non-invasive assessment.

TECHNOLOGY

The Center's technologies include Resonant Raman Scattering detection of carotenoid antioxidants in human tissue and a novel light source for biomedical spectroscopy.

ACCOMPLISHMENTS

Nutriscan, Inc. was formed during the second year of COEP funding and negotiated a license for our US Patent No. 6,205,354B1: Method and Apparatus for Noninvasive Measurement of Carotenoids and Related Chemical Substances in Biological Tissue. This patent was issued March 20, 2001 for technology supported by earlier COEP funding. The other Center technologies are anticipated to require further development with COEP funding before commercialization can occur.

UNIVERSITY OF UTAH

Can you imagine.....

A non-invasive optical laser technique that can detect and treat cancerous cells in the skin or mucosal tissue??



**Licensed 2 fields of use,
one patent issued**

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CENTER FOR

BIOREMEDIATION

CENTER

The Center for Bioremediation was established to channel research, development and marketing of innovative heavy metal removal, recovery and pollution prevention biotechnologies into a valuable resource for WSU and Utah. The Center's focus technology is biological selenium removal. Additionally, technologies include arsenic removal and cyanide degradation.

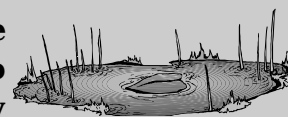
TECHNOLOGY

The Center's biotechnologies are based on research conducted by the Center's principal investigators; and over 7.7 million US Bureau of Mines (USBM) research dollars are invested in the development of metal bioremediation technologies. At the forefront of the Center focus technologies is a field-proven selenium removal technology capable of economically removing this contaminant from wastewaters to a point below detection. The Center's selenium technology is based on a novel implementation path requiring a thorough front-end analysis, specially adapted, naturally occurring microorganisms, and a patent-pending proprietary process of configurations. This path provides unique bioremediation technologies that are more economical, faster and more durable than other technologies.

WEBER STATE UNIVERSITY

Can you imagine.....

A faster and more economical way to remove heavy metals, such as arsenic or cyanide, from wastewaters to a point below detection, with naturally occurring microorganisms?



ACCOMPLISHMENTS

The Center's technology has been demonstrated to be approximately 1/10 the cost of EPA's past BDAT and removes selenium to lower levels. A final EPA report is expected later in 2001. The Montana site was viewed as a showcase site for selenium removal.

Technology is 1/10 the cost of past BDAT and removes selenium to lower levels

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CENTER FOR

CELL SIGNALING

CENTER

The Center for Cell Signaling (CCS) develops and commercializes new technologies that are important to the treatment of cancer, allergy, asthma and inflammation. CCS has 20 participating faculty from eight different departments at the University of Utah, one faculty member from Brigham Young University and two from Utah State University, focusing their talents in a synergistic way to create and commercialize new technologies.

TECHNOLOGY

The CCS focuses on the synthesis and drug applications of new molecules involved in cell to cell communication, from controlling the biochemical pathways of signal transduction to designing instruments used to study these processes. Current developments include tools necessary for the elucidation of chemical pathways that regulate normal and abnormal cell responses. These tools include chemical synthesis, expression of recombinant proteins, preparation of monoclonal antisera, biomolecular interaction analysis and phage display of high affinity peptides. New methods are being developed to assay for signal binding and processing proteins, utilizing high throughput screening.

ACCOMPLISHMENTS

The Center faculty continues to excel in inventions. This year they filed 21 invention disclosures, 20 patents or provisionals on June 30, 2001. Two companies have been spun off using Center technology, Salus Therapeutics, Inc and Echelon Research Laboratories. Salus (established 1999), which focuses on identifying ribozyme and antisense targets for specific diseases. The company has research collaborations with the Center and has received two SBIR awards totaling over \$850,000.

continued....

UNIVERSITY OF UTAH

Can you imagine.....

A new class of pharmaceuticals that provide therapeutic effects by artificially signaling selected cells in the body to perform desired actions to the benefit of the patient?



Echelon Research Laboratories, established in 1998, markets reagents and kits for identifying oncogene activators and suppressors important in cancer diagnosis. Echelon received six SBIR/STTR awards totaling over \$2 million and has successfully licensed Center technologies, which are now in production.

**21 Invention Disclosures
Two technology licenses signed**

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CENTER FOR

COMPLIANT MECHANISMS

CENTER

The objective of Compliant Mechanisms is to accelerate and streamline the development and commercialization process of compliant mechanisms so that they may be quickly licensed to existing or new companies. The use of innovative and patented compliant mechanisms will give existing companies a clear competitive advantage and will provide a unique and valuable product for new companies. The potential market applications and opportunities are immense.

ACCOMPLISHMENTS

Some examples of compliant mechanisms that have been designed and tested are: fishing reel, bicycle freewheel, derailleur and brakes, pull start for small gasoline engines, centrifugal clutches, string trimmer, small garden tiller clutch, go-cart clutch, continuously variable transmissions (CVT), general purpose belt drive CVT, second generation bicycle CVT prototype, bistable mechanisms, compliant parallel motion mechanisms, constant-force mechanisms, electrical contacts for PDA docking stations, fully compliant bistable micro mechanism, thermal actuators, linear motion micro-bistable mechanism and two position latching mechanism.

BRIGHAM YOUNG UNIVERSITY

Can you imagine.....

A method for redesigning any complex mechanical part to significantly reduce the numbers of parts, simplify the manufacturing process, reduce costs and end up with a more reliable and wear-resistant device?



TECHNOLOGY

The Center possesses methods for the design of compliant mechanisms that have reduced part count and reduced cost and increased precision compared to conventional mechanisms. A number of specific classes of mechanisms have been investigated and developed for commercialization.

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CENTER FOR

Dairy Technology Commercialization

CENTER

The Center for Dairy Technology Commercialization was established to commercialize technologies developed at the Western Dairy Center, whose research is funded by a consortium of dairy food companies, for a variety of applications in the dairy industry.

TECHNOLOGY

The Center is currently pursuing commercialization of the following inventions: utilization of bacterial cultures that produce polysaccharides externally to increase cheese yield; production of flavored cheese using high pressure injection technology, using textured whey protein both as a meat extender and as a high protein snack food.

**A new company was formed
and is based in Tooele, Utah.**

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UTAH STATE UNIVERSITY

Can you imagine.....

**A new method of
modifying cheese flavor
by using high-
pressure injection technology?**



ACCOMPLISHMENTS

Cheese trials are have begun using the exopolysaccharide gene to determine commercial interest among cheese producers. A new injector was manufactured and sample product was sent to potential users of the technology. Two commercial companies are currently evaluating the technology. One company intends to modify the cheese flavor and the other company will use the technology as a method of creating new and novel cheeses for children.

CENTER FOR

ELECTRONIC MEDICAL EDUCATION

CENTER

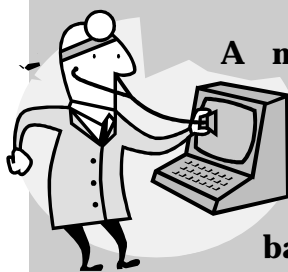
The Center for Electronic Medical Education (CEME) is part of the Electronic Medical Education Resource Group (EMERG) in the Department of Radiology at the University of Utah (U of U). The overall goal of the CEME is to develop and commercialize component software originally created by EMERG that streamlines the collection, creation, access and retrieval of image intensive teaching and reference data. These needs addressed by EMERG are prevalent at medical institutions around the world. The focus of this center is to develop component software tools for use by end users and specialists in image intensive fields, specifically targeted towards the case creation and information management needs.

TECHNOLOGY

The center continues the development of software to streamline the use of image intensive teaching and reference data in medicine. The software consists of author and platform tools used to create medical reference and education products as part of a component based information management and processing system. The software tools will be used by both authors and end-users to continuously update the medical reference image data.

UNIVERSITY OF UTAH

Can you imagine.....



A medical doctor who comes across a case he has not seen before, taps into a medical image database and accesses the most current database of images and case studies to help improve patient diagnosis instantaneously?

ACCOMPLISHMENTS

All of the software that has been developed within EMERG and the Center is owned by the U of U since its development involved significant use of University resources. Two technology disclosures have been submitted. Those disclosures are Medical Image Annotation Tool and publishing software (beans) for image-oriented print and digital outputs (screen display via CD-ROM, DVD, on-line, etc).

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CENTER FOR

INTELLIGENT COMPUTER TOOLS

CENTER

The Center for Intelligent Computer Tools "graduated" this year. This was the fifth year of funding. The Center focuses on interactive image segmentation, composition and digital image editing, automated creation/browsing of digital (microfilm) libraries, semi-automated creation of virtual environments-especially with Virtual Venues for the 2002 Winter Olympics

TECHNOLOGY

The technology development effort concentrates in Intelligent Scissors/Paint, represents full color images with limited palette and no visual loss, resolution enhancement to improve (internet) image appearance through data dependent triangulation; document understanding; automated zoning and browsing of digital documents by content; line intersection: automated object-based line intersection for recovery of 3D (building) geometry; virtual environments: creation of realistic virtual environments (Olympics, BYU) from real-world images; image blending: automatic shape blending and image object blending, object-based image editing: ungroup, delete, texture synthesis; image-based object modeling: photographic based resolution enhancement of objects

**License agreements signed
with Park City Entertainment
and Adobe Systems**

BRIGHAM YOUNG UNIVERSITY

Can you imagine.....

Careening down an Olympic bobsled run, aware of the twisting turns and angles of the sled while watching the surrounding landscape rush by, all on your computer screen with every visual sensation artificially created by software?



ACCOMPLISHMENTS

Algorithms for intelligent paint segmentation and localization were updated with high level visual effects. The prototype digital microfilm parser/browser was enhanced with significant new tools. The virtual environment terrain database for the Virtual Olympics was expanded and terrain details such as buildings, a bobsled run, and ski runs were added. Additional license agreements were signed with Adobe Systems and Park City Entertainment.

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CENTER FOR

MICROBE DETECTION & PHYSIOLOGY

CENTER

The focus of this center is the development of technologies that lead to the real time detection of pathogenic micro-organisms. This involves the development of novel pathogen capture molecules, platform development, prototype development, and commercialization. Industries where this technology is useful include pharmaceuticals, biomedicine, biotechnology, veterinary, production agriculture, food processing, public health, defense, and water and sewage treatment.

TECHNOLOGY

The primary focus of the Center is bacterial detection, but other targets are also investigated. To date, four technologies are under development: ImmunoFlow, ImmunoDNA, GlycoBind, and TissueTag. Each technology has a unique use and application but is not limited to a single type of use. For example, ImmunoFlow has many fields of use ranging from water to air and has the potential to detect many types of bacteria. Initial prototypes are available for *Bacillus globgii* spores, *Lactobacillus*, *Salmonella* and *E. coli* O157 cells. Each type of assay has a maximum detection time of 30 minutes with a sensitivity of less than 10 cells. A unique feature of each technology is that it is volume independent; both large (tens of liters) and small (1 to 100 milliliters) samples are commonly used. Each technology is at a different stage of development with ImmunoFlow being the most developed.

UTAH STATE UNIVERSITY

Can you imagine....

Being able to detect less than 10 cells of a harmful pathogen, such as salmonella or E. coli, for example in milk, within 30 minutes?



ACCOMPLISHMENTS

ImmunoFlow is under a license option agreement. A fully automated beta-prototype has been built to run ImmunoFlow.

Each technology has a unique use and application but is not limited to a single type of use.

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CENTER FOR

MULTI-DIMENSIONAL INFORMATION

CENTER

The Center for the Representation of Multi-Dimensional Information (CROMDI) was established to commercialize audio-visualization technology (IntuInfo) that facilitates the rapid and accurate analysis of large quantities of quickly changing data. CROMDI is an interdisciplinary team dedicated to the innovative representation of information, comprised of experts in the fields of Architecture, Computer Science, Anesthesia, BioEngineering, Finance, Mathematics, Psychology, Communication and Music. These diverse experts participate with their own unique perspectives and provide solutions to complex information design needs through a unique methodology and iterative process.

TECHNOLOGY

By visually displaying multiple variables using various objects and colors, a wide range of information is clearly presented. The association between the graphical objects and the data is designed to facilitate rapid understanding of large quantities of data. To be "state of the art" in many fields is to represent information with tables of numbers, waveforms, pie charts, diagrams, icons and matrices. IntuInfo enables recognition of events that is significantly faster, more accurate, less mentally demanding and with less training than is possible using existing technologies. This patent pending technology has been applied in medicine, finance, and entertainment, and may also be successfully utilized in other applications where decision making depends on monitoring or analyzing large quantities of information.

UNIVERSITY OF UTAH

Can you imagine....

A new audio-visualization technology that facilitates the rapid and accurate analysis of large quantities of quickly changing data, such as stock market information?



ACCOMPLISHMENTS

Filed 5 patent extensions: 3 for medicine, 1 for finance and 1 for inertia; 3 additional medical display technology modules and enhancements; sponsored research by GE Medical Systems with an option to license financial display prototype. Market and sponsored research and licensing discussions with potential partner.

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CENTER FOR

PETROLEUM RESEARCH

CENTER

The mission of the Petroleum Research Center (PERC) at the University of Utah is to conduct research and development studies leading to practical, cost-effective solutions to liquid hydrocarbon production, handling and transportation. With funding from the U.S. Department of Energy and the petroleum industry, the PERC coordinates basic and applied research in: the physical properties and physical and chemical thermodynamics of naturally occurring hydrocarbons, development of pipeline transportation and flow assurance strategies, and simulation, optimization and control of oil and gas recovery methods.

TECHNOLOGY

Petroleum Research Center (PERC) was funded to commercialize and market two specific areas of work; understanding problems related to production, transportation and processing of waxy and asphaltenic crude oils and subsequent alleviation of these problems and developing a variety of methods and software tools (models) for the efficient and optimal production of oil and gas from underground reservoirs. Over the last several years, oil companies and federal agencies have funded (and continue to fund) research in PERC, which is an integral part of the Department of Chemical and Fuels Engineering at the University of Utah.

UNIVERSITY OF UTAH

Can you imagine.....

A variety of methods and software tools for the efficient and optimal production of oil and gas from underground reservoirs?



ACCOMPLISHMENTS

Applicability of the discrete-fracture model demonstrated technology for wax measurement developed. First generation of thermodynamic and pipeline flow models complete.

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Profitable Uses of Agricultural Byproducts

CENTER

The Center for Profitable Uses of Agricultural Byproducts located was established to strengthen the economy of Utah, particularly the rural economy, by working closely with farmers and ranchers and other agricultural related businesses transferring technologies, utilizing agricultural production and processing byproducts. Byproducts of no or little value are transformed into energy and other salable items using technology developed at the center.

TECHNOLOGY

The technology developed at Utah State University for profitable uses for food production and processing byproducts is manifested in two major areas: 1) anaerobic systems that can produce energy (biogas) and soil amendment from manure and food processing waste, and 2) components of a high rate aerobic bioreactor (drum compost based) system that make the process more cost effective and products produced by the process more valuable. Most of the emphasis in the year 2000 was on the anaerobic technology.

UTAH STATE UNIVERSITY

Can you imagine.....



A technology utilizing agricultural byproducts of little or no value at all and transforming these byproducts into a profitable business?

ACCOMPLISHMENTS

A fully operational system has been built at the Caine Dairy at Utah State University, open for visits to see the system functioning, creating a showcase of this technology. This technology is very unique and easy to manage, with a high treatment rate and reliability. This Center has partnered with Specialized Analysis Engineering, a Utah company, and a new company is currently being formed.

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CENTER FOR

SMART SENSORS

CENTER

Smart Sensors probe the environment and modify their function in order to improve their data gathering capability. A smart sensor adapts to its environment and sends improved data to the main processing computer. A smart sensor melds sensor, signal processing, and computer technologies. Applications span medicine, precision agriculture, electronics manufacturing, wireless communication, transportation and radar.

TECHNOLOGY

The Center for Smart Sensors focuses on two core technologies; imbedded antennas and circuits for measuring length, distance, and impedance. Four support technologies include wireless communication, complex 3D simulation, numerical optimization, and user interfaces. Projects in the center include an early warning system for computer disk drive failure, a preflight test system for aging aircraft wiring, and a system to protect military personnel from being overrun by tanks. Antennas to communicate with implanted medical devices, measure the moisture of corn, and detect weather-critical features of atmospheric plasma are under development.

UTAH STATE UNIVERSITY

Can you imagine.....



An early warning system for computer disk drive failure, a preflight test system for aging aircraft wiring and a system to protect military personnel from being overrun by tanks?

ACCOMPLISHMENTS

Products under development include: Computer Sentinent Board, "Smart Wiring" in situ of aging wiring before flight, Imbedded Antenna for moisture measurement of corn, Imbedded Antenna for communication with medical implants, wireless communication system for environmental sensors on the H60 helicopter, water level sensor for irrigation, personnel avoidance safety system.

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CENTER FOR

SOLID OXIDE FUEL CELLS

CENTER

This center "graduated" this year. SOFC was established to develop technology for the conversion of chemical energy of oxidation of gaseous fuels such as natural gas, coal, gas, biogas, and gasifiable fuels such as gasoline and diesel, into electricity for residential and remote applications, hospitals, malls, school buildings, office buildings, etc. The objective is to develop 1 to 5 kW modular units that can be readily integrated with a fuel processor. These units will also have applications in transportation as auxiliary units. In addition, the Center technology is ideally suited for small portable power units in the 10 to 100 W range. The applications include portable power for medical devices, laptop computers, portable power for soldiers, etc.

TECHNOLOGY

The principal Center technology is planar, anode-supported, thin YSZ film, low temperature, Solid Oxide Fuel Cell (SOFC). The main focus of the Center technology is the development of high performance, anode-supported SOFC in 5 cm x 5 cm size, and the development of stacking strategy. The stacks are internally manifolded and utilize flexible, glass-free seals. The cells and stacks are thermal shock-resistant.

ACCOMPLISHMENTS

Center work has led to the filing of numerous invention disclosures and two patents. Center funding has facilitated the establishment of SOFC Consortium between the University of Utah, Gas Technology Institute, Electric Power

UNIVERSITY OF UTAH

Can you imagine.....

A portable generator you can take on your next camping trip that efficiently converts propane to electricity with no flame, no moving parts, no noise and only water vapor as exhaust pollutant?



Research Institute and Materials and Systems Research, Inc. All four Consortium members have recently signed a Letter of Intent to form a new company for the commercialization of the Center SOFC technology. The University of Utah will be an equity participant. The Center funding has also led to other external funding from agencies such as DOE, DOC, DARPA.

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